

This listing of claims will replace all prior versions, and listings, of claims in the application:

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1 Claim 1 (currently amended): A solid-state imaging device
2 comprising:
3 a pixel unit constituted by a two-dimensional array of
4 pixels for generating charge in correspondence to received
5 light and accumulating the charge for a predetermined
6 period of time;
7 a vertical transfer unit for vertically transferring
8 charge from the pixels in the pixel unit, a horizontal
9 transfer unit for horizontally transferring charge from the
10 vertical transfer unit;
11 shift gates each provided between each pixel and the
12 vertical transfer unit for reading out the charge in the
13 pixels to the vertical transfer unit, gate electrodes for
14 controlling the shift gates; and
15 a plurality of lead lines and a plurality of
16 connection terminals for connecting the gate electrodes to
17 an external circuit,
18 the gate electrodes making up N of gate electrode
19 groups in which the lines belonging to each coset of
20 modulo N within successive pixel rows are connected to
21 common lead lines, N being a predetermined natural number
22 between 4 and one half the number of pixels in a column,
23 and also being ~~a~~ the minimum number corresponding to ~~a~~ the
24 periodic unit about ~~of gate electrode connections to~~ from
25 said gate electrodes to said connection terminals within
26 said successive pixel rows, the gate electrodes having
27 common connection terminals to reduce the number of the
28 connection terminals to less than N.

1 Claim 2 (currently amended): A solid-state imaging device
2 comprising:

3 a pixel unit constituted by a two-dimensional array of
4 pixels for generating charge in correspondence to received
5 light and accumulating the charge for a predetermined
6 period of time;

7 a vertical transfer unit for vertically transferring
8 charge from the pixels in the pixel unit, a horizontal
9 transfer unit for horizontally transferring charge from the
10 vertical transfer unit;

11 shift gates each provided between each pixel and the
12 vertical transfer unit for reading out the charge in the
13 pixels to the vertical transfer unit, gate electrodes for
14 controlling the shift gates; and

15 a plurality of lead lines and a plurality of
16 connection terminals for connecting the gate electrodes to
17 an external circuit,

18 gate control lines connected to gate electrode groups
19 in which horizontal lines belonging to each coset of modulo
20 N within successive pixel rows are connected commonly; N
21 being a predetermined natural number between 4 and one half
22 the number of pixels in a column, and also being a-the
23 minimum number corresponding to a the periodic unit about
24 of gate electrode connections to from said gate electrodes
25 to said connection terminals within said successive pixel
26 rows, being combined with each other so as to reduce the
27 number of the connection terminals to less than N.

1 Claim 3 (currently amended): A solid-state imaging device
2 comprising:

3 a pixel unit constituted by a two-dimensional array of
4 pixels for generating charge in correspondence to received

5 light and accumulating the charge for a predetermined
6 period of time;

7 a vertical transfer unit for vertically transferring
8 charge from the pixels in the pixel unit, a horizontal
9 transfer unit for horizontally transferring charge from the
10 vertical transfer unit;

11 shift gates each provided between each pixel and the
12 vertical transfer unit for reading out the charge in the
13 pixels to the vertical transfer unit, gate electrodes for
14 controlling the shift gates; and

15 a plurality of lead lines and a plurality of
16 connection terminals for connecting the gate electrodes to
17 an external circuit,

18 the gate electrodes being provided in a predetermined
19 number N of gate electrode groups such that horizontal line
20 number of the gate electrode groups which are connected to
21 respective common lead lines belong to each same residue
22 class of modulo N, N being a predetermined natural number
23 between 4 and one half the number of pixels in a column,
24 and also being ~~a~~ the minimum number corresponding to ~~a~~ the
25 periodic unit about ~~of gate electrode~~ connections ~~to~~ from
26 said gate electrodes to said connection terminals within
27 said successive pixel rows, some of the gate electrode
28 groups being commonly connected so that the connection
29 terminals are less in number than N.

1 Claim 4 (currently amended): A solid-state imaging device
2 comprising:

3 a pixel unit constituted by a two-dimensional array of
4 pixels for generating charge in correspondence to received
5 light and accumulating the charge for a predetermined
6 period of time;

7 a vertical transfer unit for vertically transferring
8 charge from the pixels in the pixel unit, a horizontal
9 transfer unit for horizontally transferring charge from the
10 vertical transfer unit;

11 shift gates each provided between each pixel and the
12 vertical transfer unit for reading out the charge in the
13 pixels to the vertical transfer unit, gate electrodes for
14 controlling the shift gates;

15 and a plurality of lead lines and a plurality of
16 connection terminals for connecting the gate electrodes to
17 an external circuit,

18 the gate electrodes making up N of gate electrode
19 groups in which the lines belonging to each coset of modulo
20 N within successive pixel rows are connected to common lead
21 lines, N being a predetermined natural number between 4 and
22 one half the number of pixels in a column, and also being a
23 the minimum number corresponding to a the periodic unit
24 about of gate electrode connections to from said gate
25 electrodes to said connection terminals within said
26 successive pixel rows, the gate electrode groups having
27 common connections to reduce the number of the connection
28 terminals to less than N,

29 wherein the commonly connected gate electrode groups
30 are always controlled in the same way in each of all
31 predetermined read-out modes including selective pixel
32 read-out modes by selective shift gate driving.

1 Claim 5 (currently amended): A solid-state imaging device
2 comprising:

3 a pixel unit constituted by a two-dimensional array of
4 pixels for generating charge in correspondence to received

5 light and accumulating the charge for a predetermined
6 period of time;
7 a vertical transfer unit for vertically transferring
8 charge from the pixels in the pixel unit, a horizontal
9 transfer unit for horizontally transferring charge from the
10 vertical transfer unit;
11 shift gates each provided between each pixel and the
12 vertical transfer unit for reading out the charge in the
13 pixels to the vertical transfer unit, gate electrodes for
14 controlling the shift gates; and
15 a plurality of lead lines and a plurality of
16 connection terminals for connecting the gate electrodes to
17 an external circuit,
18 gate control lines connected to gate electrode groups
19 in which the horizontal lines belonging to each coset of
20 modulo N within successive pixel rows are connected
21 commonly, N being a predetermined natural number between 4
22 and one half the number of pixels in a column, and also
23 being a the minimum number corresponding to a the periodic
24 unit about of gate electrode connections to from said gate
25 electrodes to said connection terminals within said
26 successive pixel rows, being combined with each other so as
27 to reduce the number of the connection terminals to less
28 than N,
29 wherein the commonly connected gate electrode groups
30 are always controlled in the same way in each of all
31 predetermined read-out modes including selective pixel
32 read-out modes by selective shift gate driving.

1 Claim 6 (currently amended): A solid-state imaging device
2 comprising:

3 a pixel unit constituted by a two-dimensional array of
4 pixels for generating charge in correspondence to received
5 light and accumulating the charge for a predetermined
6 period of time;

7 a vertical transfer unit for vertically transferring
8 charge from the pixels in the pixel unit, a horizontal
9 transfer unit for horizontally transferring charge from the
10 vertical transfer unit;

11 shift gates each provided between each pixel and the
12 vertical transfer unit for reading out the charge in the
13 pixels to the vertical transfer unit, gate electrodes for
14 controlling the shift gates; and

15 a plurality of lead lines and a plurality of
16 connection terminals for connecting the gate electrodes to
17 an external circuit,

18 the gate electrodes being provided in a predetermined
19 number N of gate electrode groups such that horizontal line
20 number of the gate electrode groups which are connected to
21 respective common lead lines belong to each same residue
22 class of modulo N, N being a predetermined natural number
23 between 4 and one half the number of pixels in a column,
24 and also being a the minimum number corresponding to a the
25 periodic unit about ~~of gate electrode~~ connections to from
26 said gate electrodes to said connection terminals within
27 said successive pixel rows, some of the gate electrode
28 groups being commonly connected so that the connection
29 terminals are less in number than N,

30 wherein the commonly connected gate electrode groups
31 are always controlled in the same way in each of all
32 predetermined read-out modes including selective pixel
33 read-out modes by selective shift gate driving.

1 Claim 7 (previously amended): The solid-state imaging
2 device according to claim 4, wherein gate electrode groups
3 controlled in each of all the predetermined read-out modes
4 are set such as to provide a minimum number of connection
5 terminals for connecting the gate electrodes to an external
6 circuit.

1 Claim 8 (previously presented): The solid-state imaging
2 device according to claim 5 wherein gate electrode groups
3 controlled in each of all the predetermined read-out modes
4 are set such as to provide a minimum number of connection
5 terminals for connecting the gate electrodes to an external
6 circuit.

1 Claim 9 (previously presented): The solid-state imaging
2 device according to claim 6 wherein gate electrode groups
3 controlled in each of all the predetermined read-out modes
4 are set such as to provide a minimum number of connection
5 terminals for connecting the gate electrodes to an external
6 circuit.

Claims 10 and 11 (canceled)

1 Claim 12 (new): The solid-state imaging device of claim 1
2 wherein at least two horizontal lines belonging to the same
3 pixel group but to different gate electrode groups are
4 connected to a common connection terminal.

1 Claim 13 (new): The solid-state imaging device of claim 2
2 wherein at least two horizontal lines belonging to the same
3 pixel group but to different gate electrode groups are
4 connected to a common connection terminal.

1 Claim 14 (new): The solid-state imaging device of claim 3
2 wherein at least two horizontal lines belonging to the same
3 pixel group but to different gate electrode groups are
4 connected to a common connection terminal.

1 Claim 15 (new): The solid-state imaging device of claim 4
2 wherein at least two horizontal lines belonging to the same
3 pixel group but to different gate electrode groups are
4 connected to a common connection terminal.

1 Claim 16 (new): The solid-state imaging device of claim 5
2 wherein at least two horizontal lines belonging to the same
3 pixel group but to different gate electrode groups are
4 connected to a common connection terminal.

✓ 1 Claim 17 (new): The solid-state imaging device of claim 6
2 wherein at least two horizontal lines belonging to the same
3 pixel group but to different gate electrode groups are
4 connected to a common connection terminal.

1 Claim 18 (new): The solid-state imaging device of claim 1
2 wherein only two connection terminals connected to said
3 vertical transfer unit are not connected to any of the gate
4 electrodes.

1 Claim 19 (new): The solid-state imaging device of claim 2
2 wherein only two connection terminals connected to said
3 vertical transfer unit are not connected to any of the gate
4 electrodes.

1 Claim 20 (new): The solid-state imaging device of claim 3
2 wherein only two connection terminals connected to said

3 vertical transfer unit are not connected to any of the gate
4 electrodes.

1 Claim 21 (new): The solid-state imaging device of claim 4
2 wherein only two connection terminals connected to said
3 vertical transfer unit are not connected to any of the gate
4 electrodes.

1 Claim 22 (new): The solid-state imaging device of claim 5
2 wherein only two connection terminals connected to said
3 vertical transfer unit are not connected to any of the gate
4 electrodes.

1 Claim 23 (new): The solid-state imaging device of claim 6
2 wherein only two connection terminals connected to said
3 vertical transfer unit are not connected to any of the gate
4 electrodes.
